



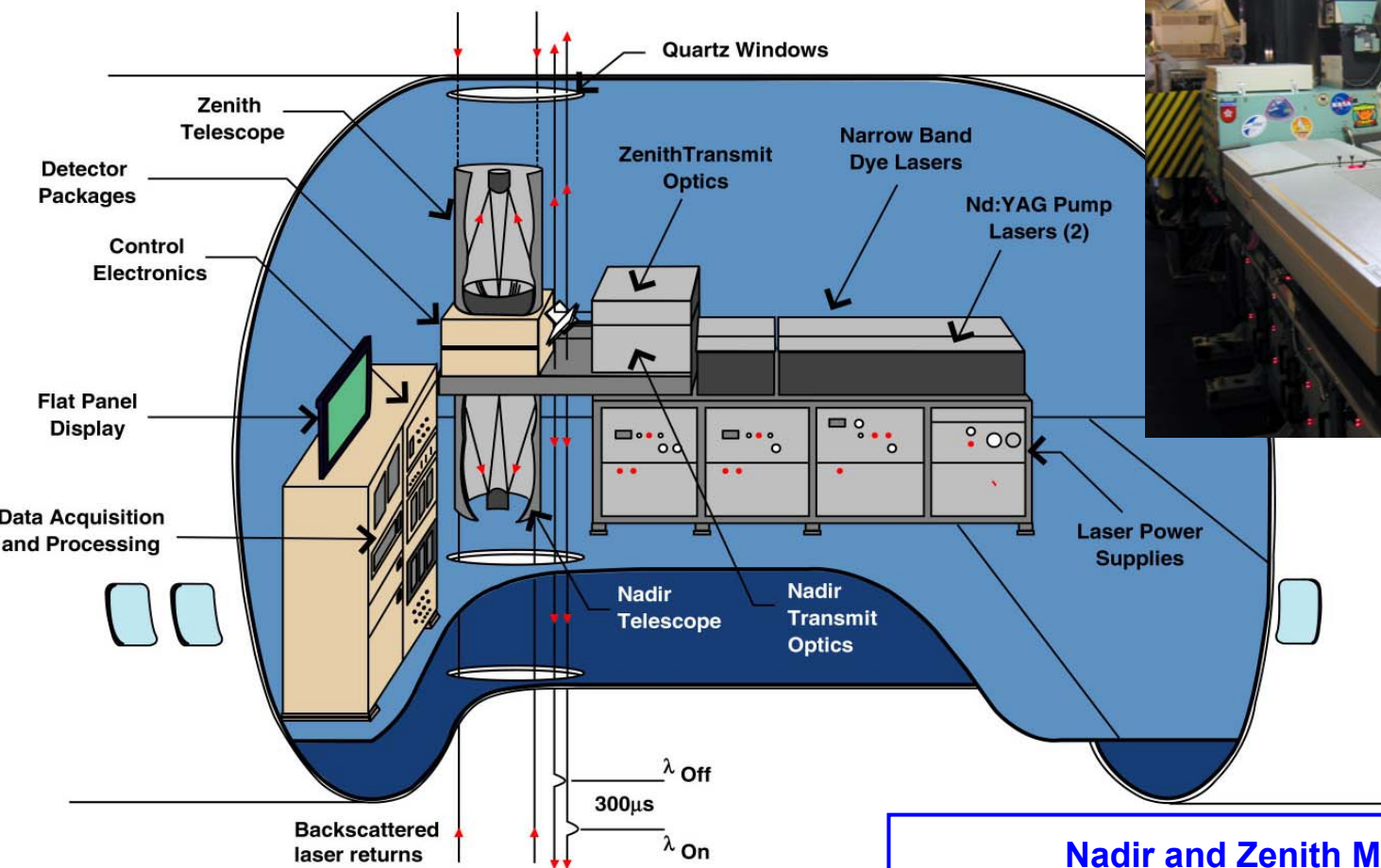
Ozone and Aerosol Measurements with Airborne Lidar During the INTEX-NA Field Experiment: Initial Results

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NASA Langley Research Center
Hampton, Virginia

INTEX-NA Workshop
29 March - 1 April 2005

Airborne Ozone & Aerosol Lidar Measurements

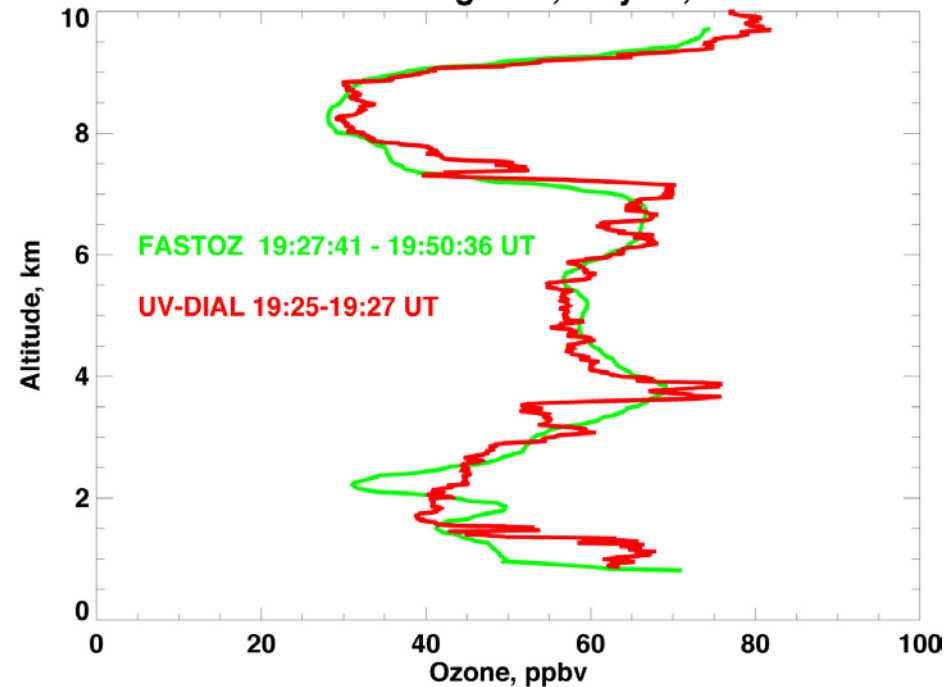


Nadir and Zenith Measurements

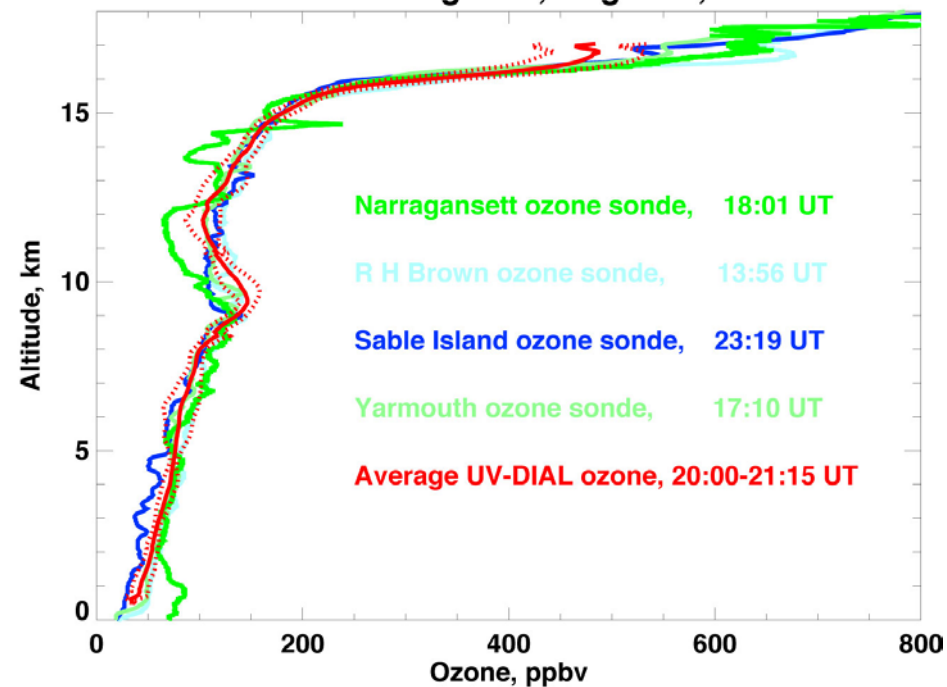
- Ozone Profiles ($\lambda_{\text{ON}} = 288 \text{ nm}$ & $\lambda_{\text{OFF}} = 300 \text{ nm}$)
- Aerosol Backscatter Ratios Profiles (1064, 600, 300 nm)
- Aerosol Depolarization Ratio Profiles (600 nm)

Sample DIAL Ozone Comparisons

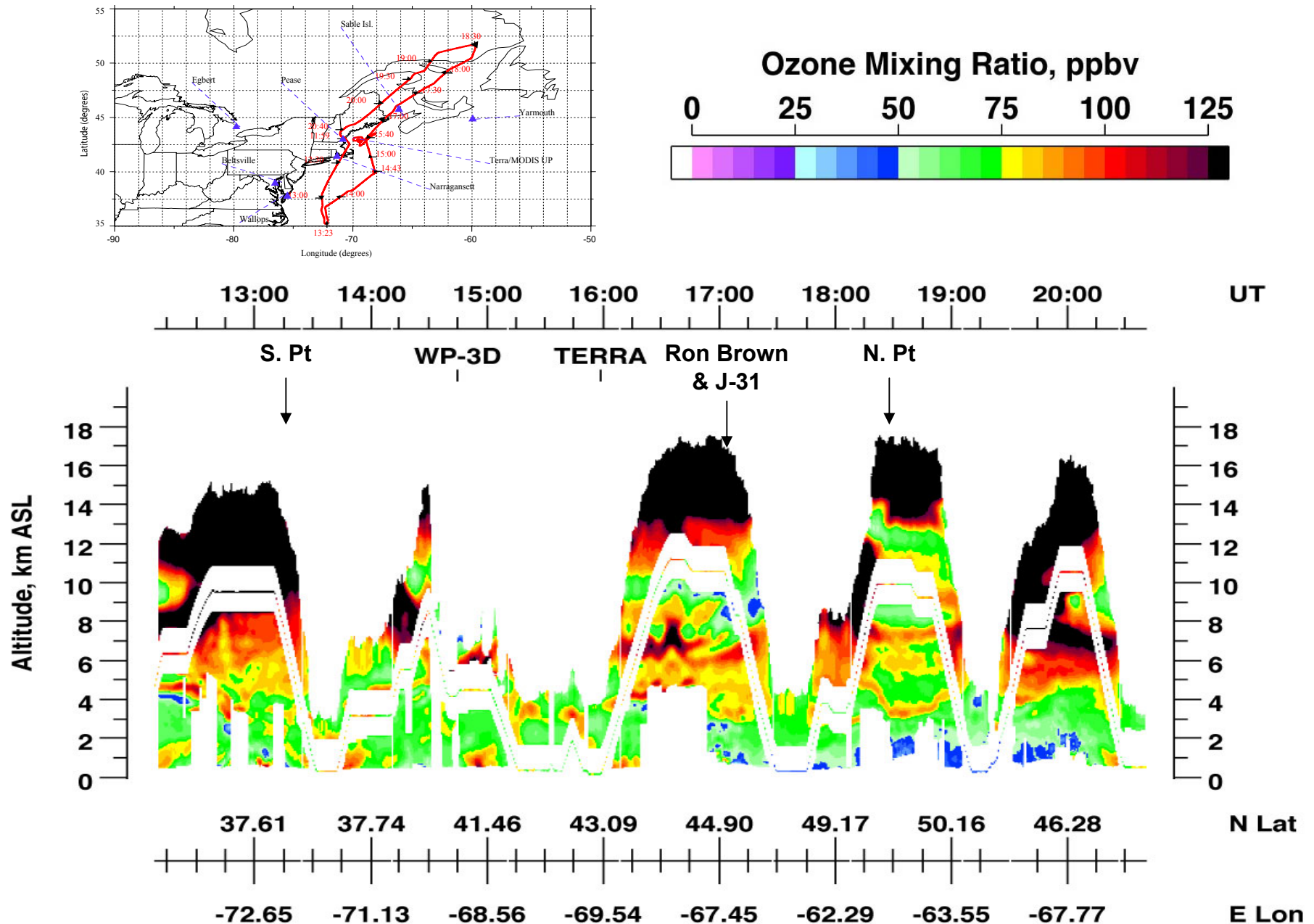
INTEX-NA Flight 07, July 12, 2004



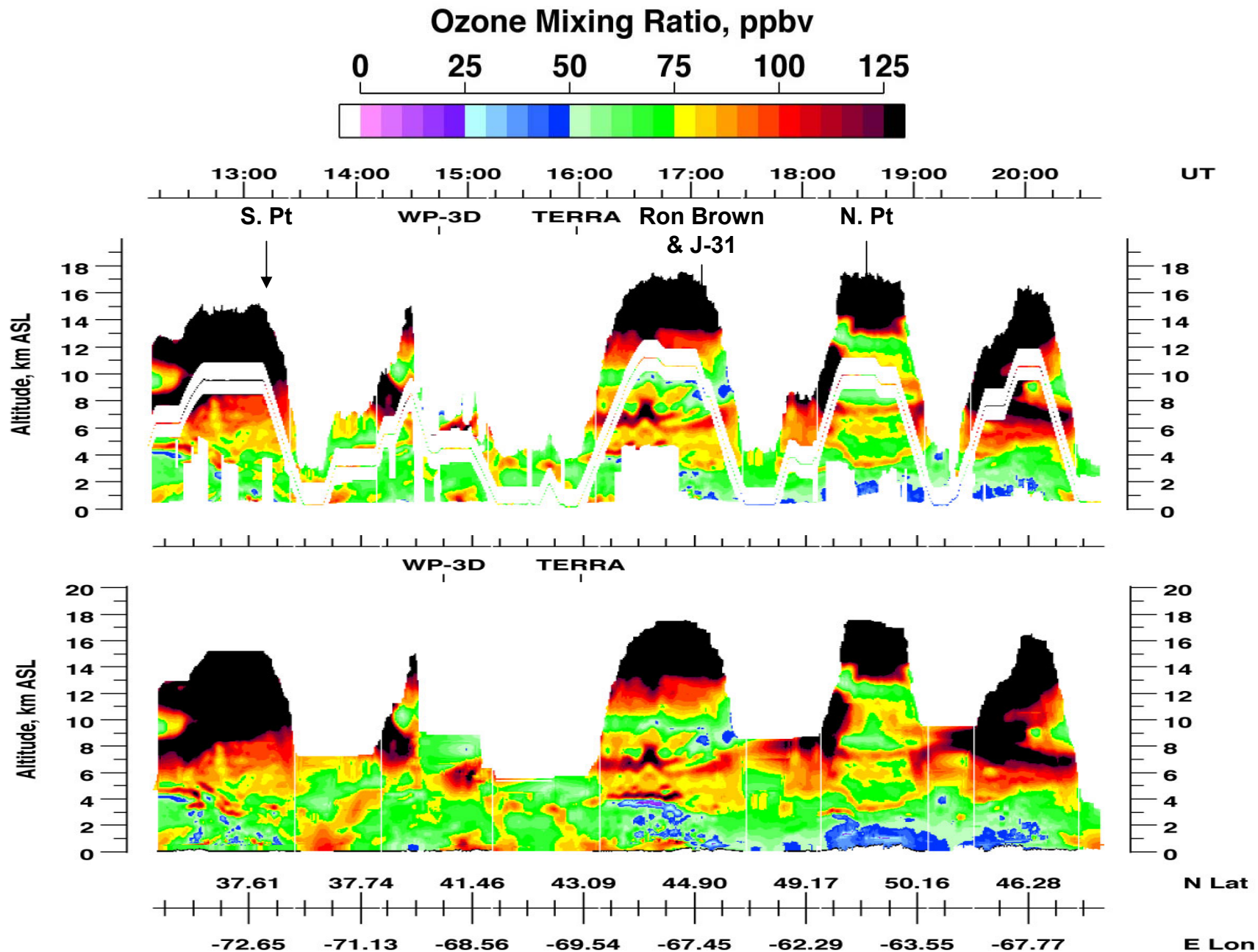
INTEX-NA Flight 15, August 2, 2004



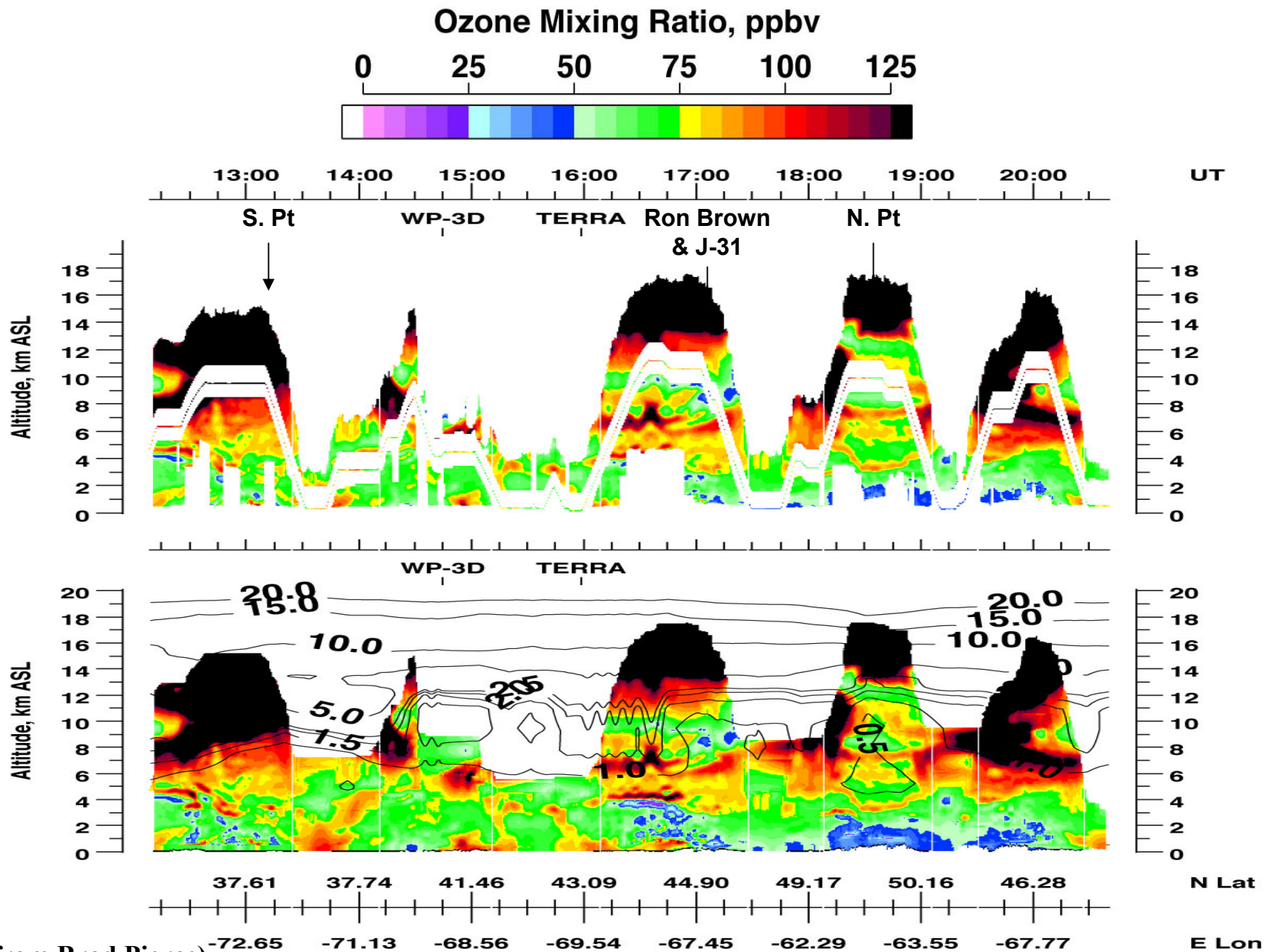
22 July 2004 (Flight #11) River of Pollution



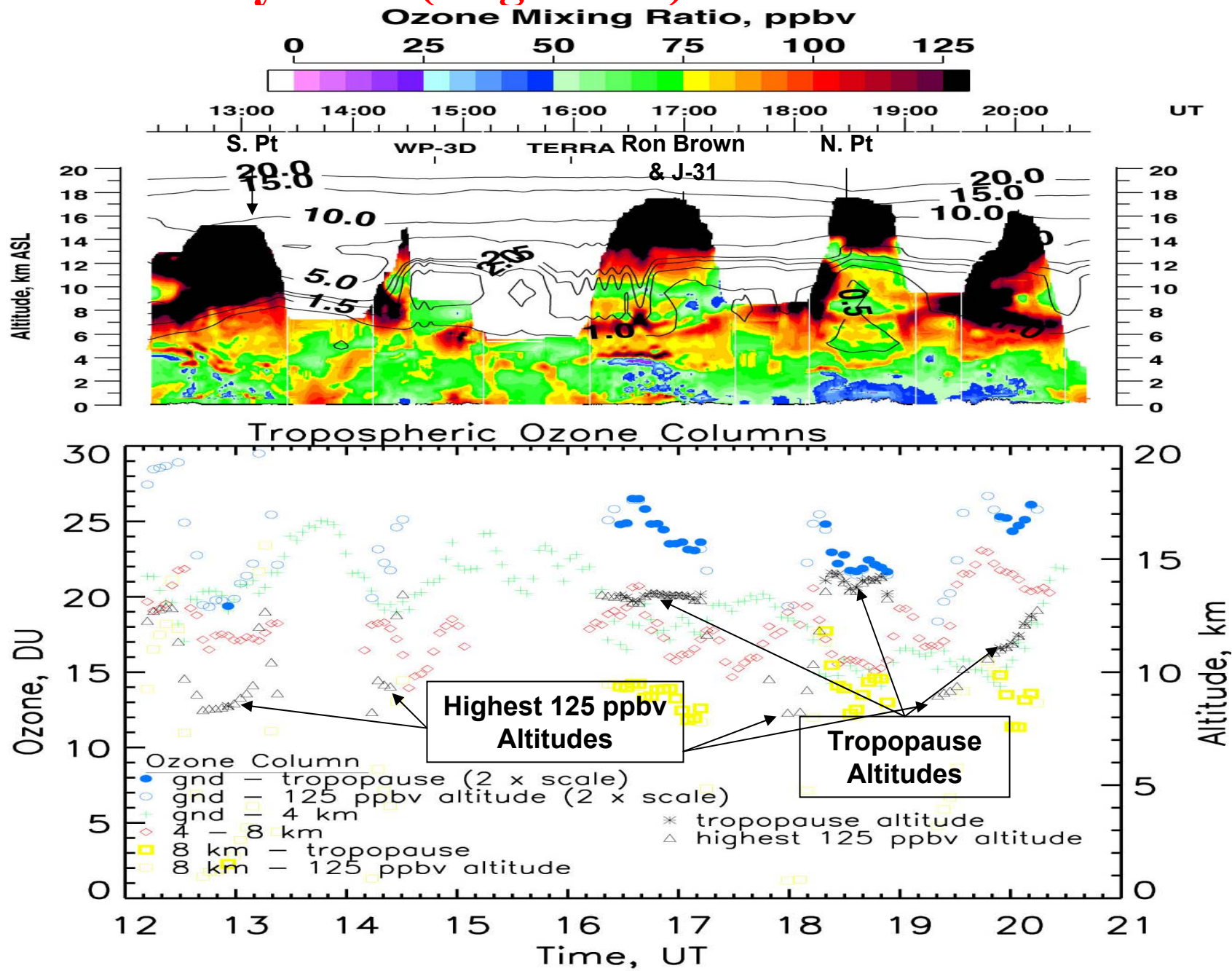
22 July 2004 (Flight #11) River of Pollution



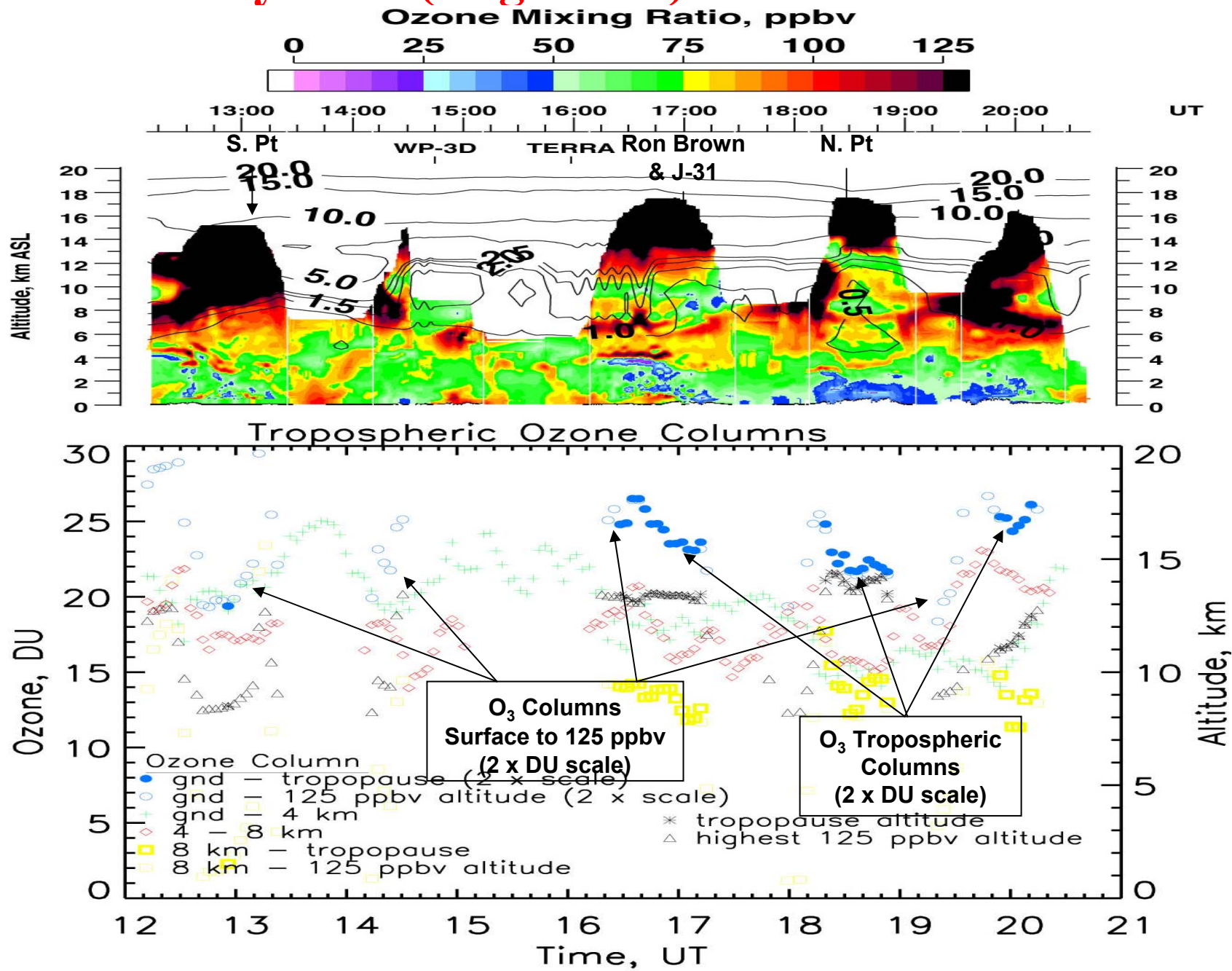
22 July 2004 (Flight #11) River of Pollution



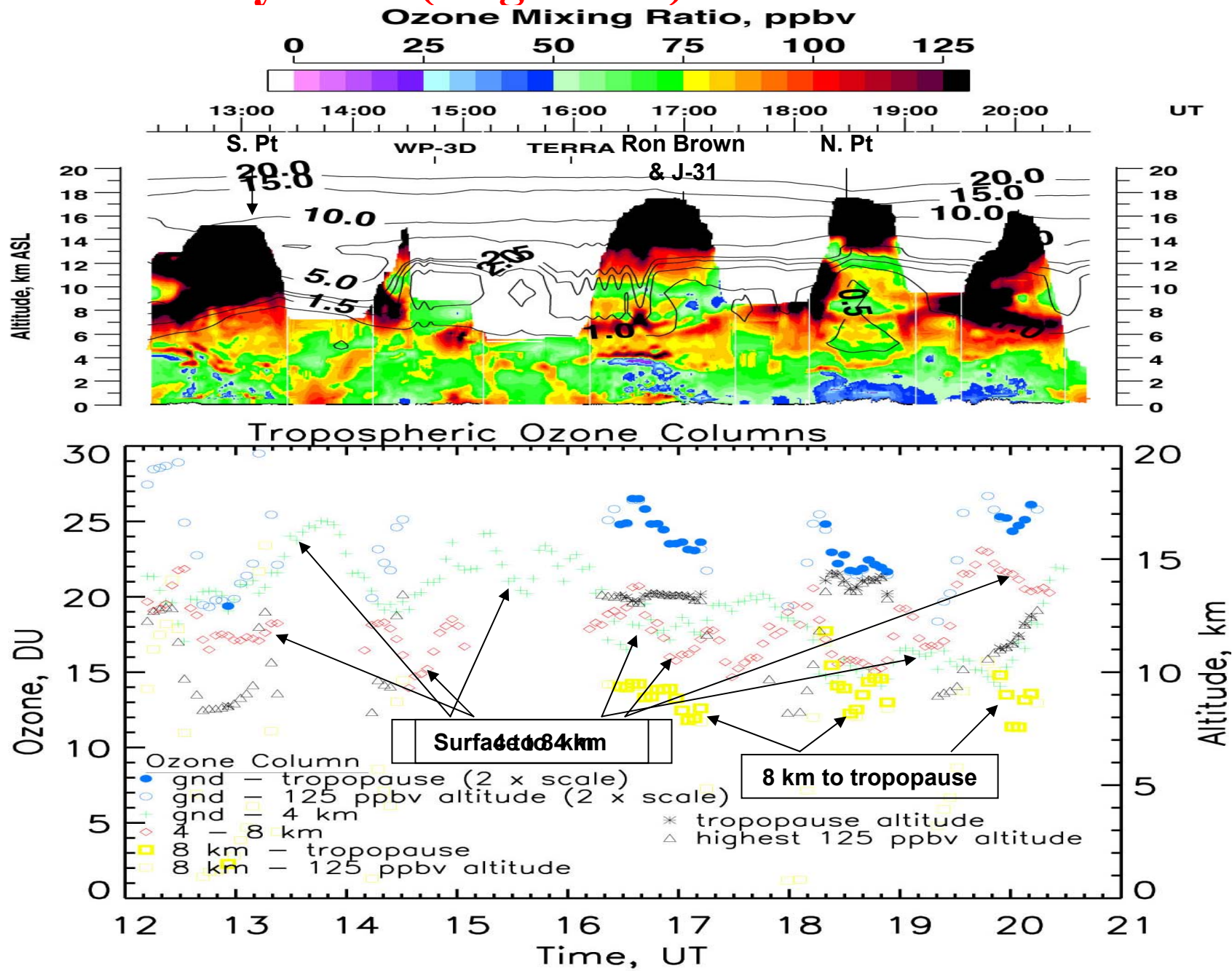
22 July 2004 (Flight #11) River of Pollution



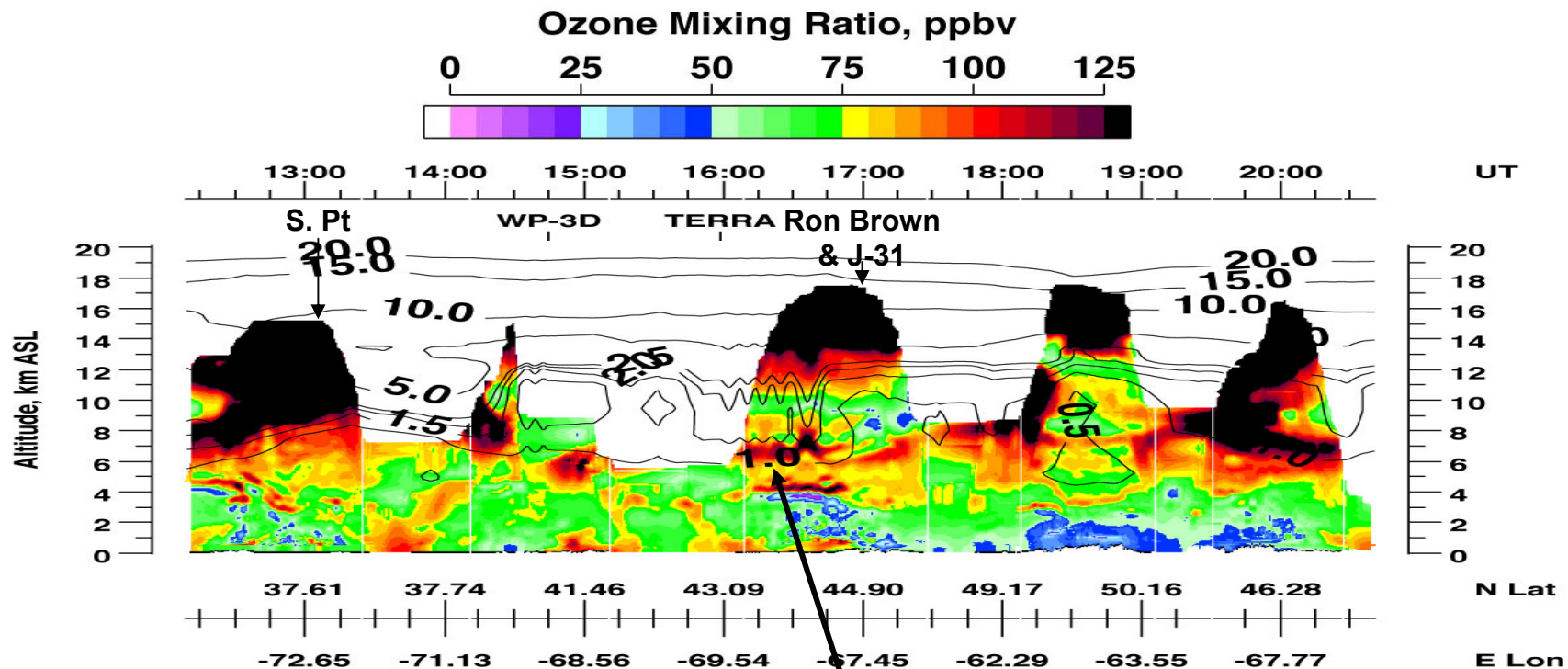
22 July 2004 (Flight #11) River of Pollution



22 July 2004 (Flight #11) River of Pollution



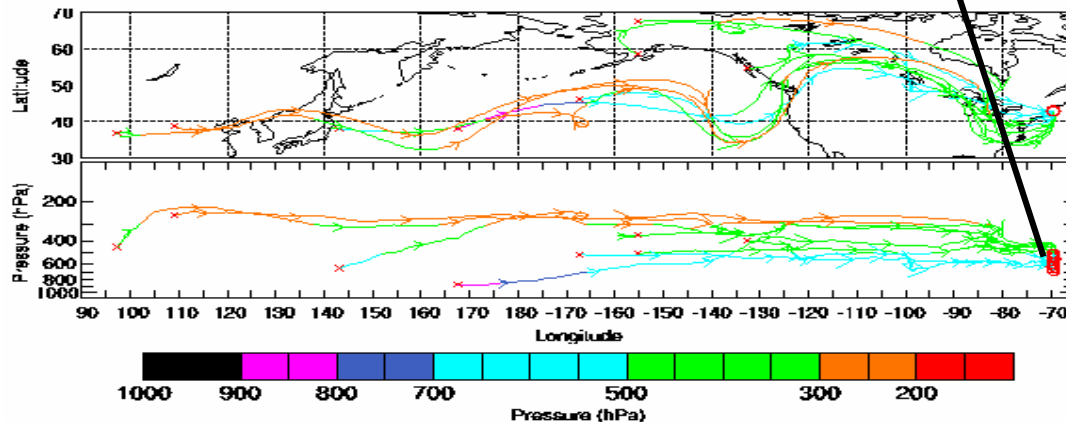
22 July 2004 (Flight #11) River of Pollution



PV Contours scaled by $1.e6 \text{ (Km}^2\text{kg}^{-1}\text{s}^{-1}\text{)}$

INTEX-NA 1-MINUTE TRAJECTORIES - FSU METEOROLOGY

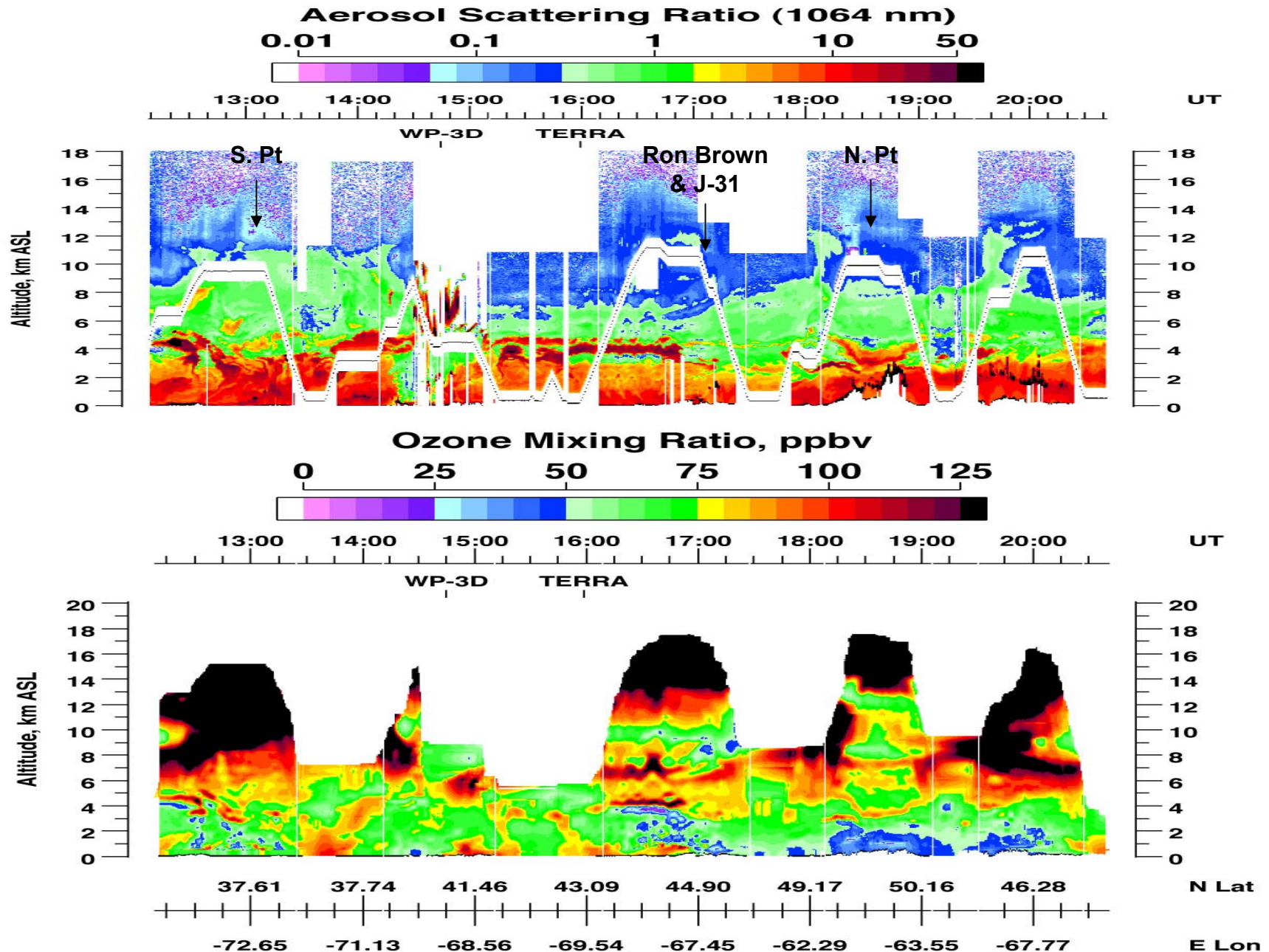
10 DAYS BACK FROM FLIGHT ON 22 JUL 2004
INITIATED AT FLIGHT LEVEL FOR FLIGHT LEG 19



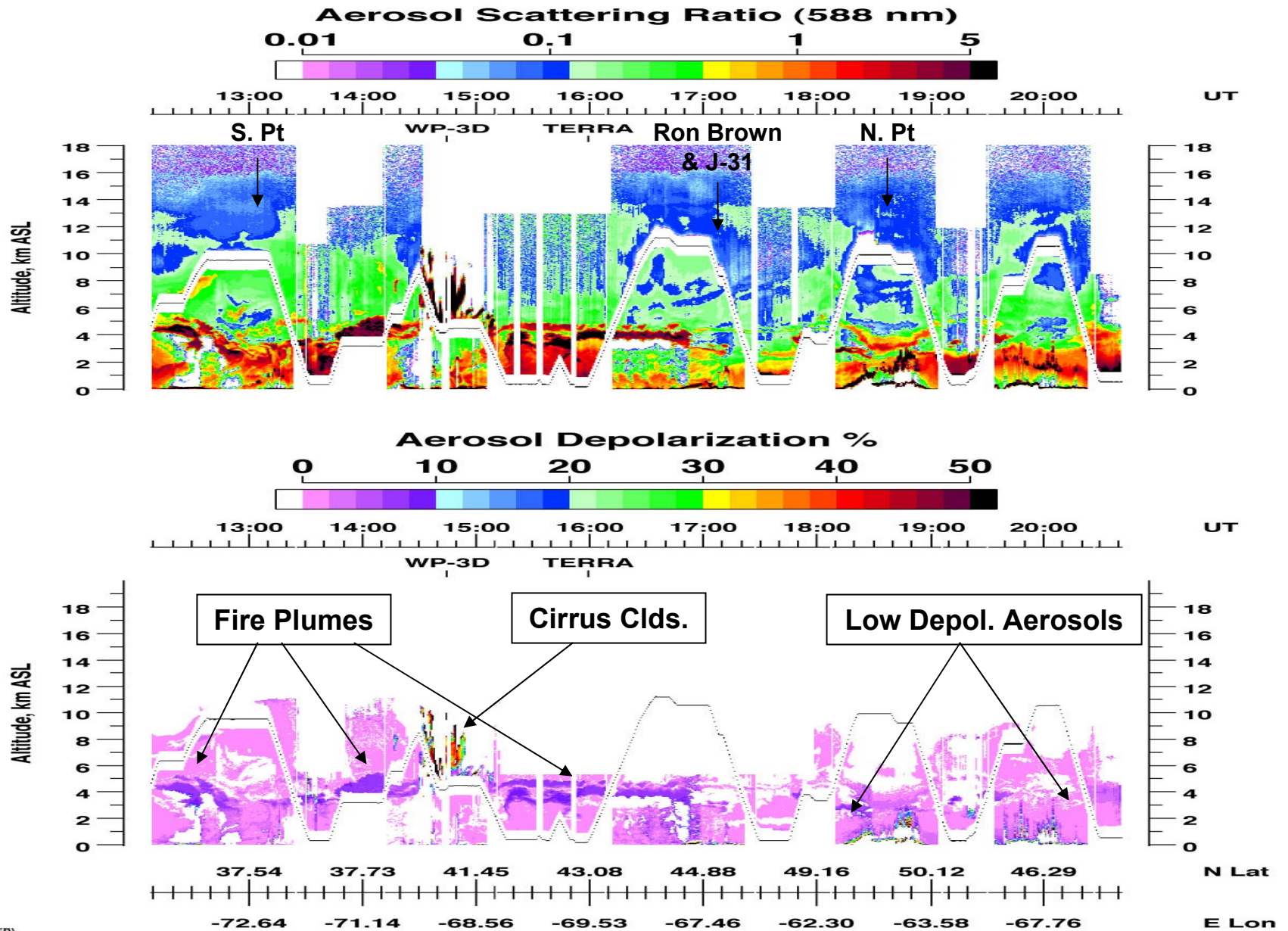
PV from RAQMS Model
(Brad Pierce)

Backtrajectories from FSU
(Henry Fuelberg)

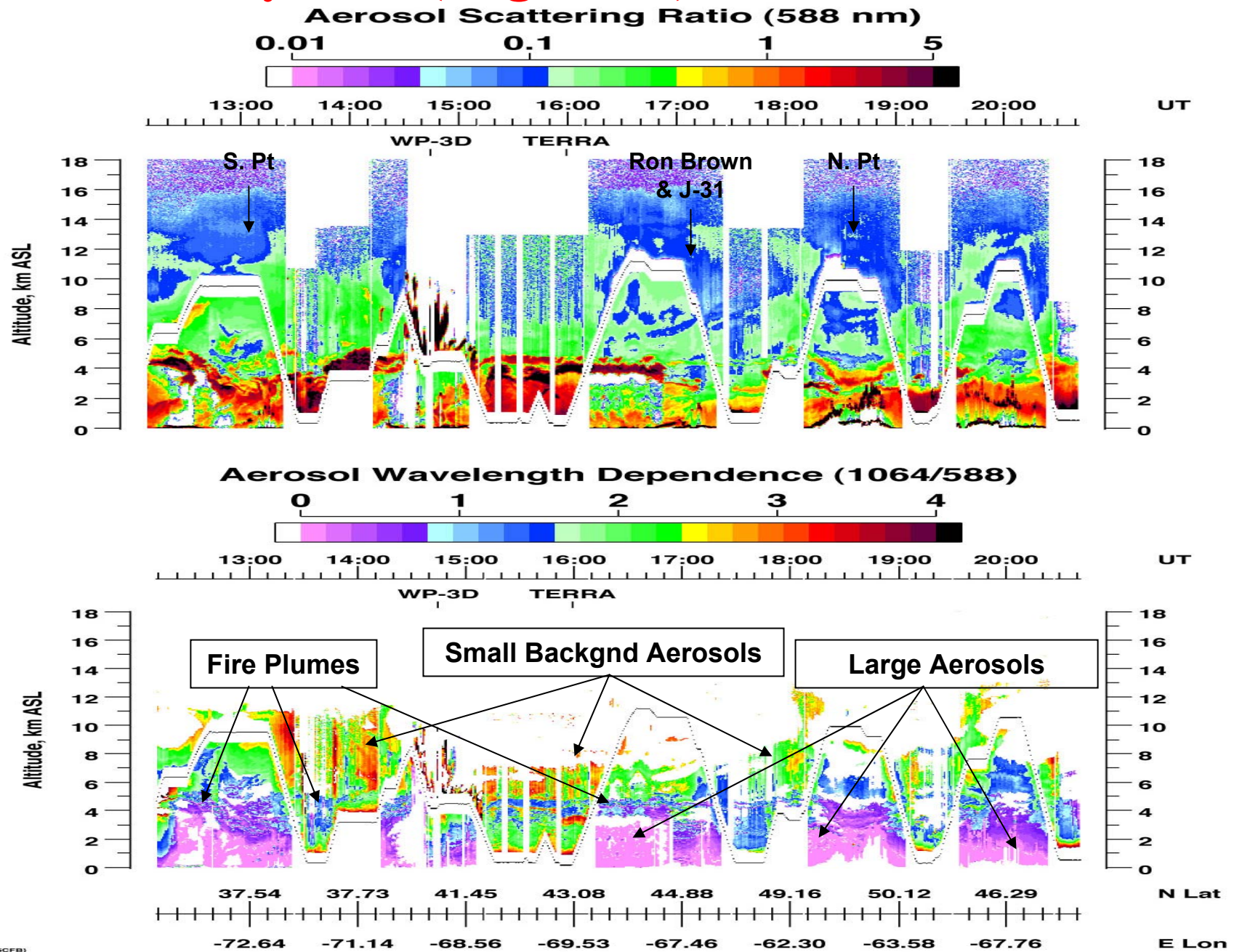
22 July 2004 (Flight #11) River of Pollution



22 July 2004 (Flight #11) River of Pollution

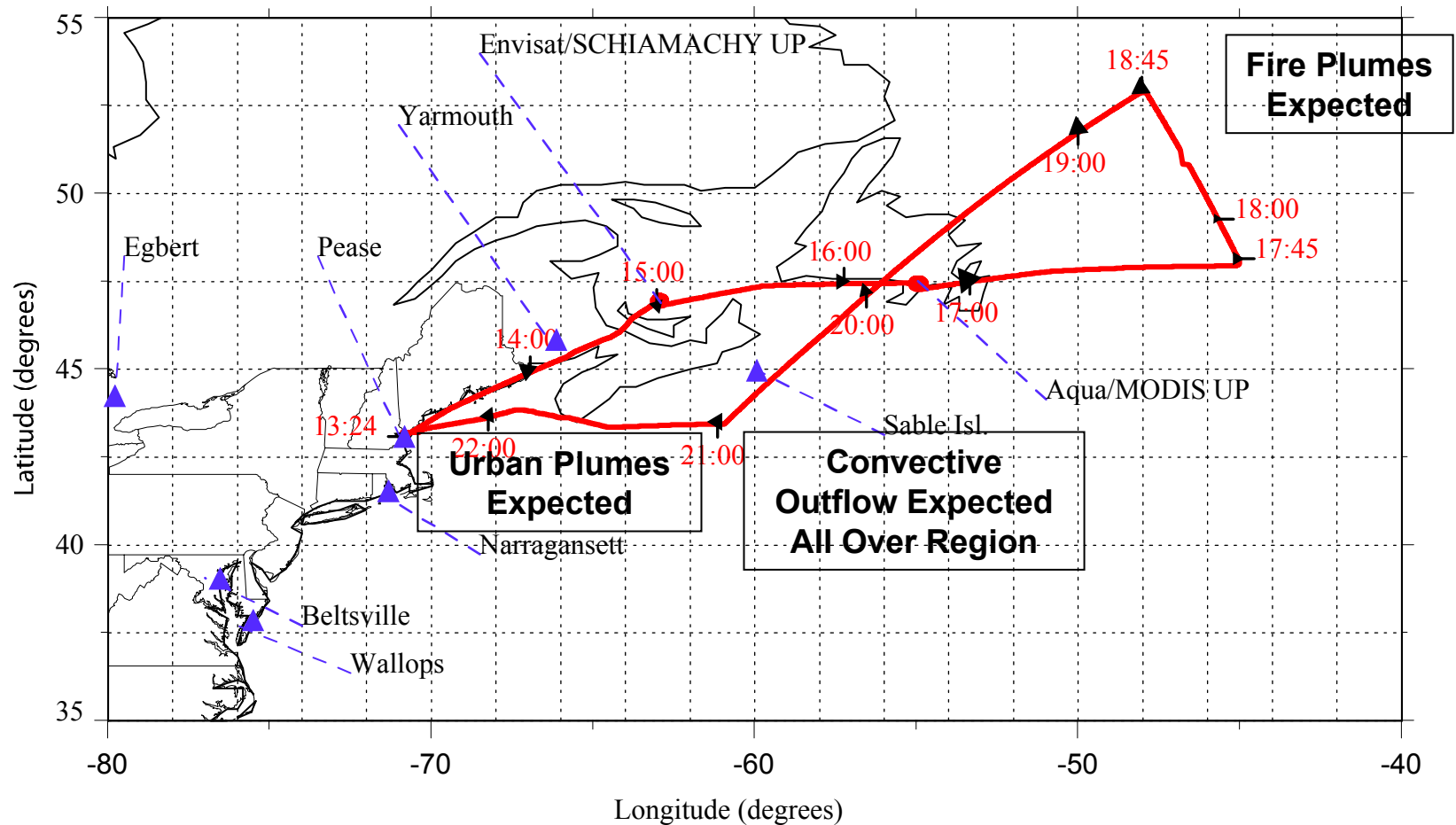


22 July 2004 (Flight #11) River of Pollution

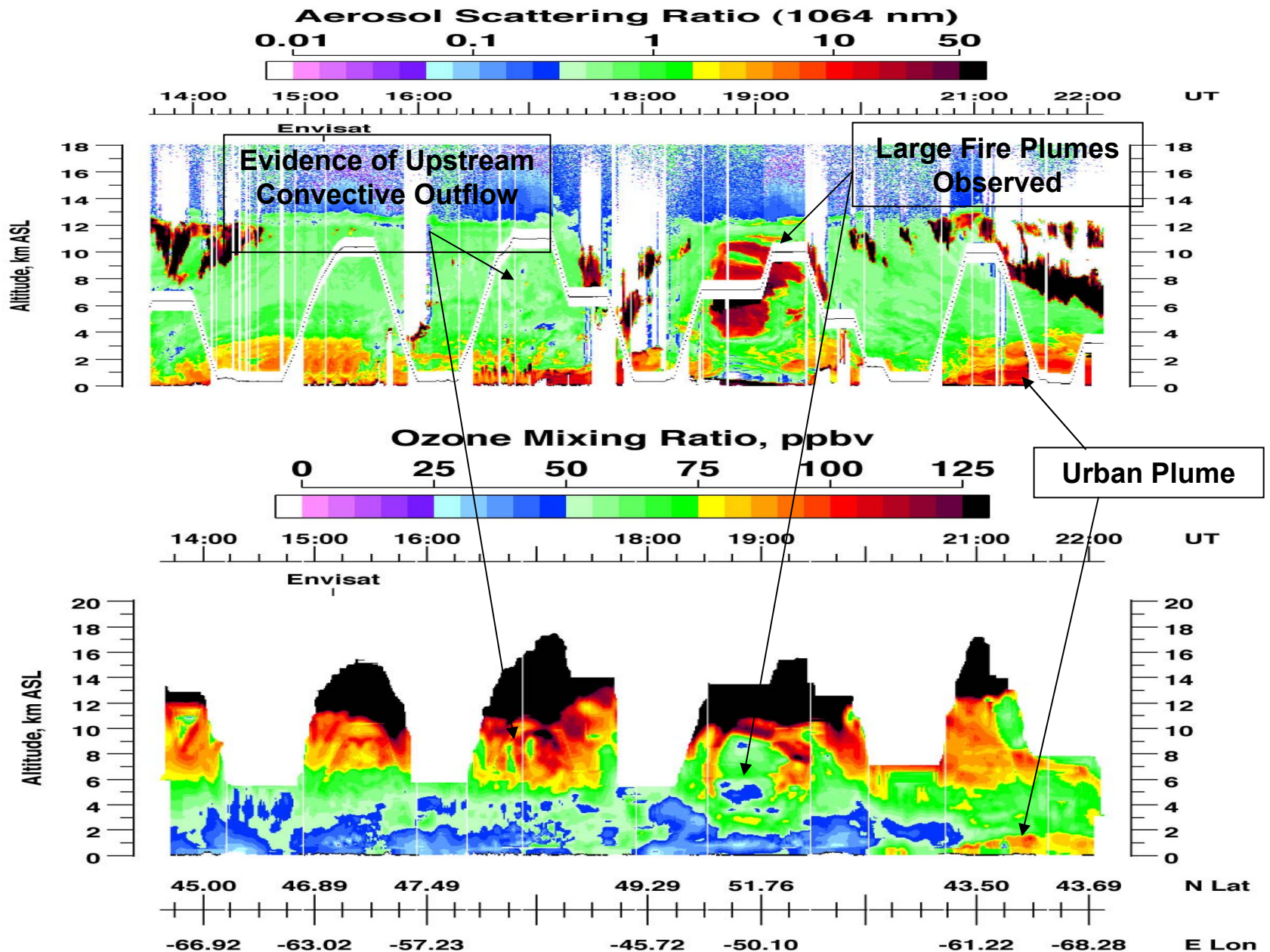


18 July 2004 (Flight #9) U.S. Outflow

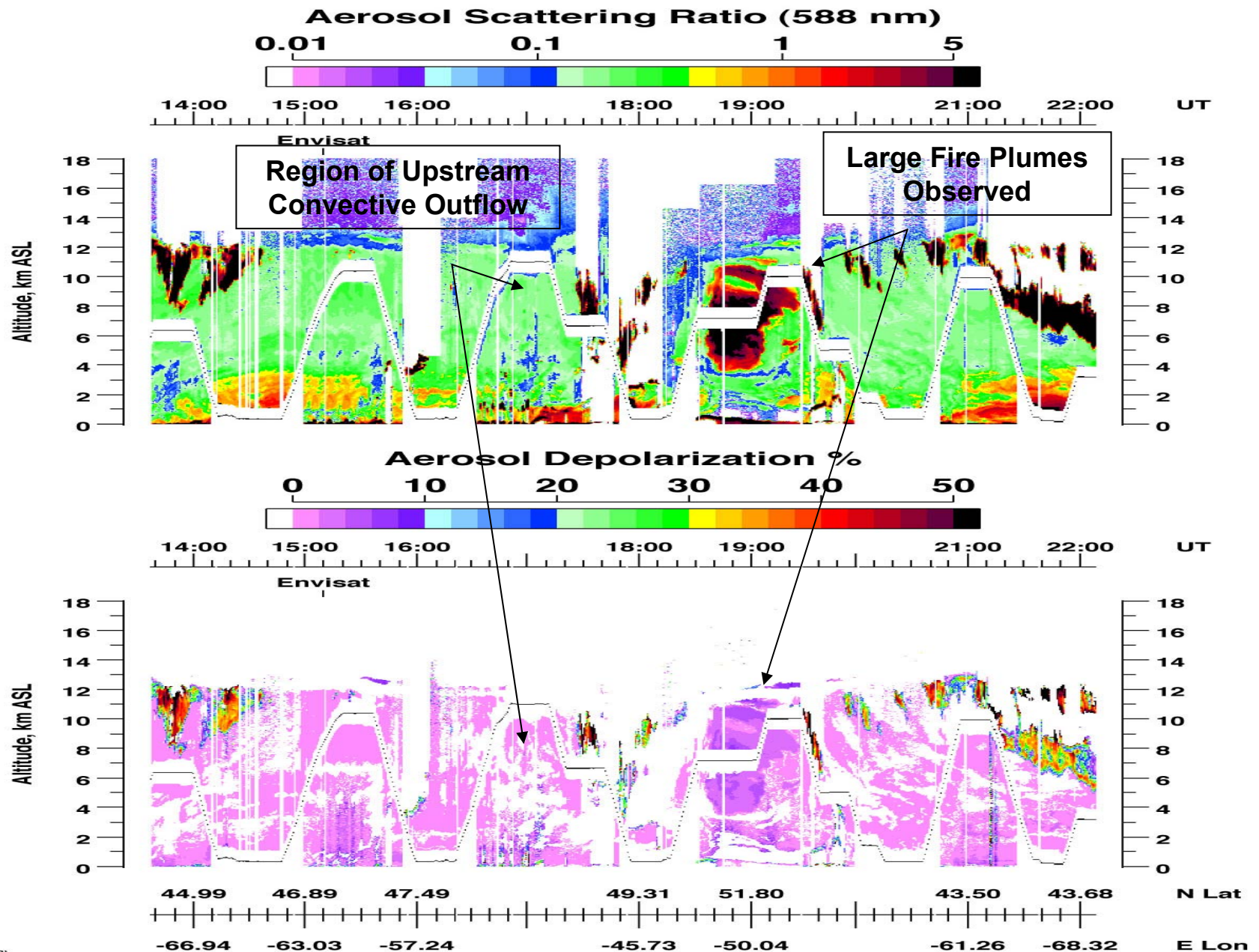
DC-8 Flight Track



18 July 2004 (Flight #9) U.S. Outflow

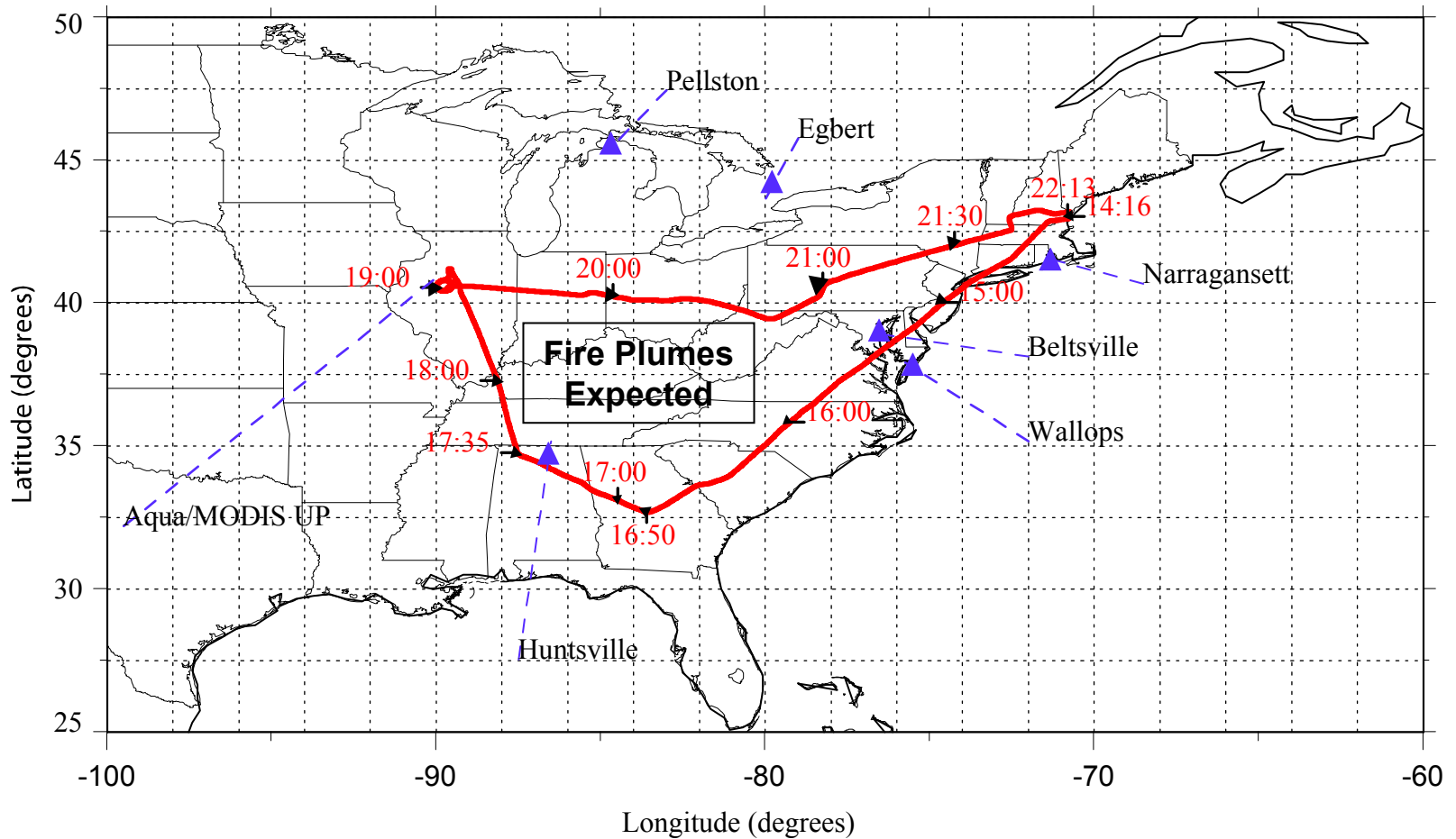


18 July 2004 (Flight #9) U.S. Outflow

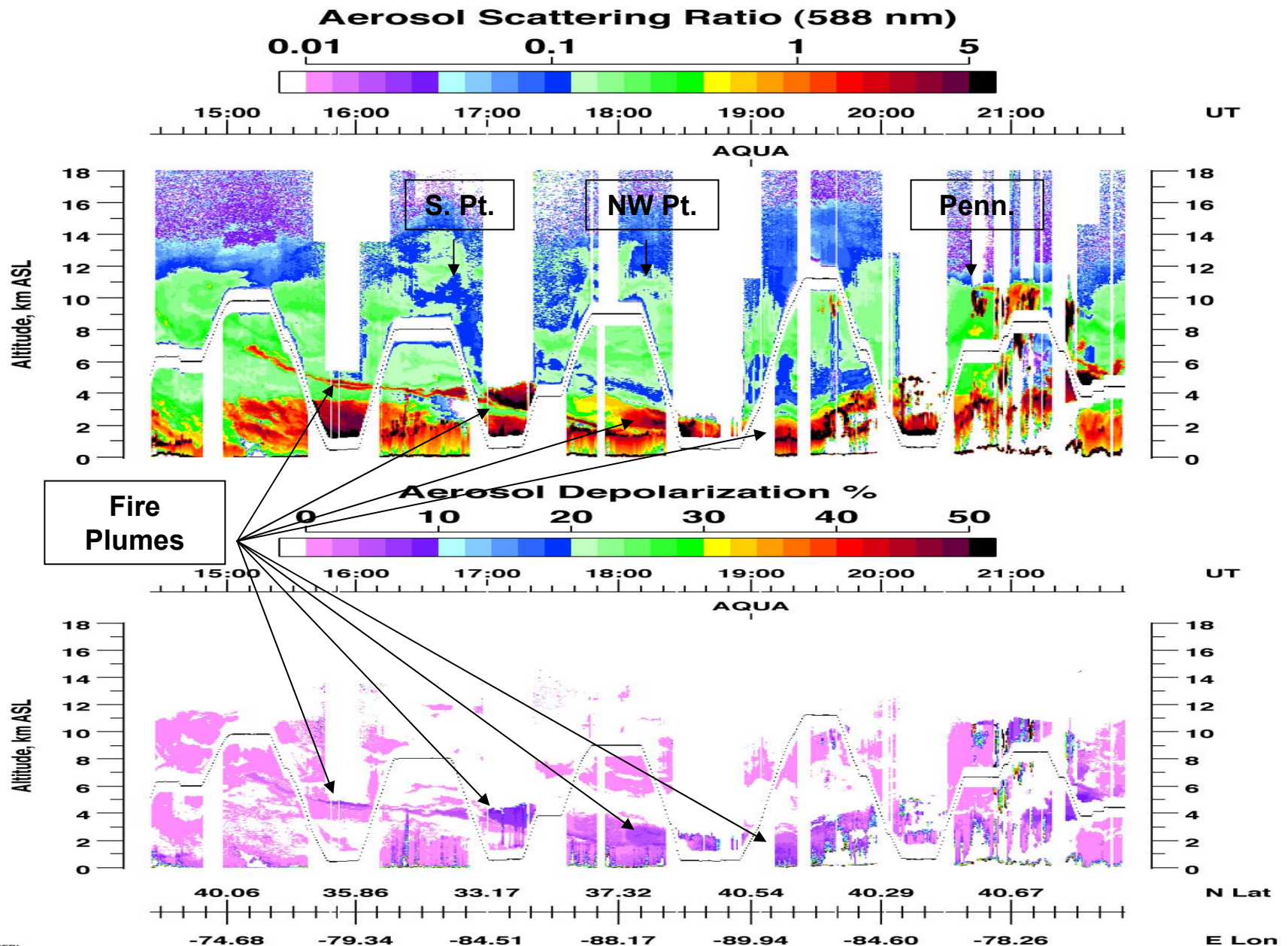


20 July 2004 (Flight #10) Alaskan Smoke Plumes

DC-8 Flight Track

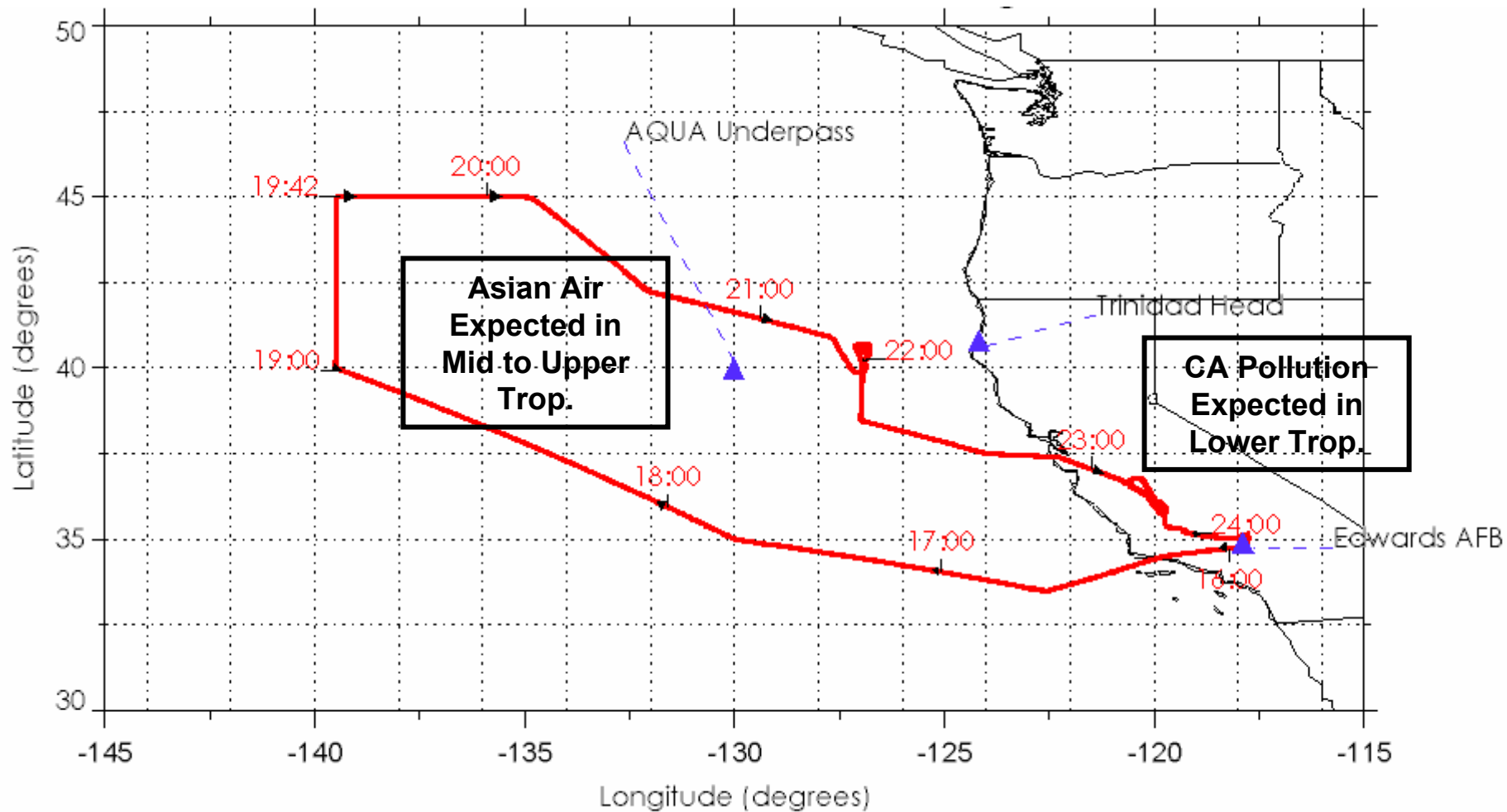


20 July 2004 (Flight #10) Alaskan Smoke Plumes

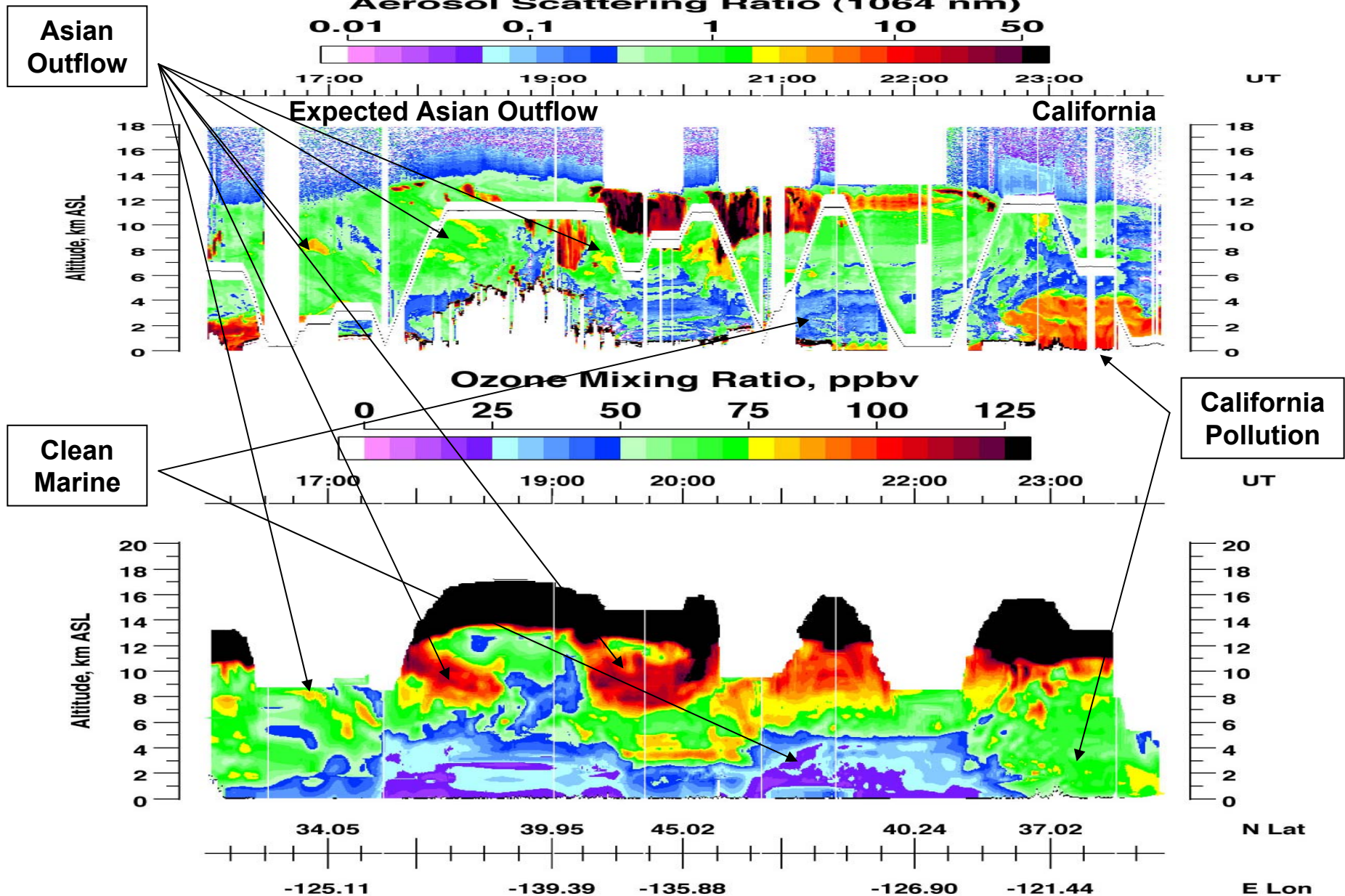


1 July 2004 (Flight #3) Asian & CA Outflow

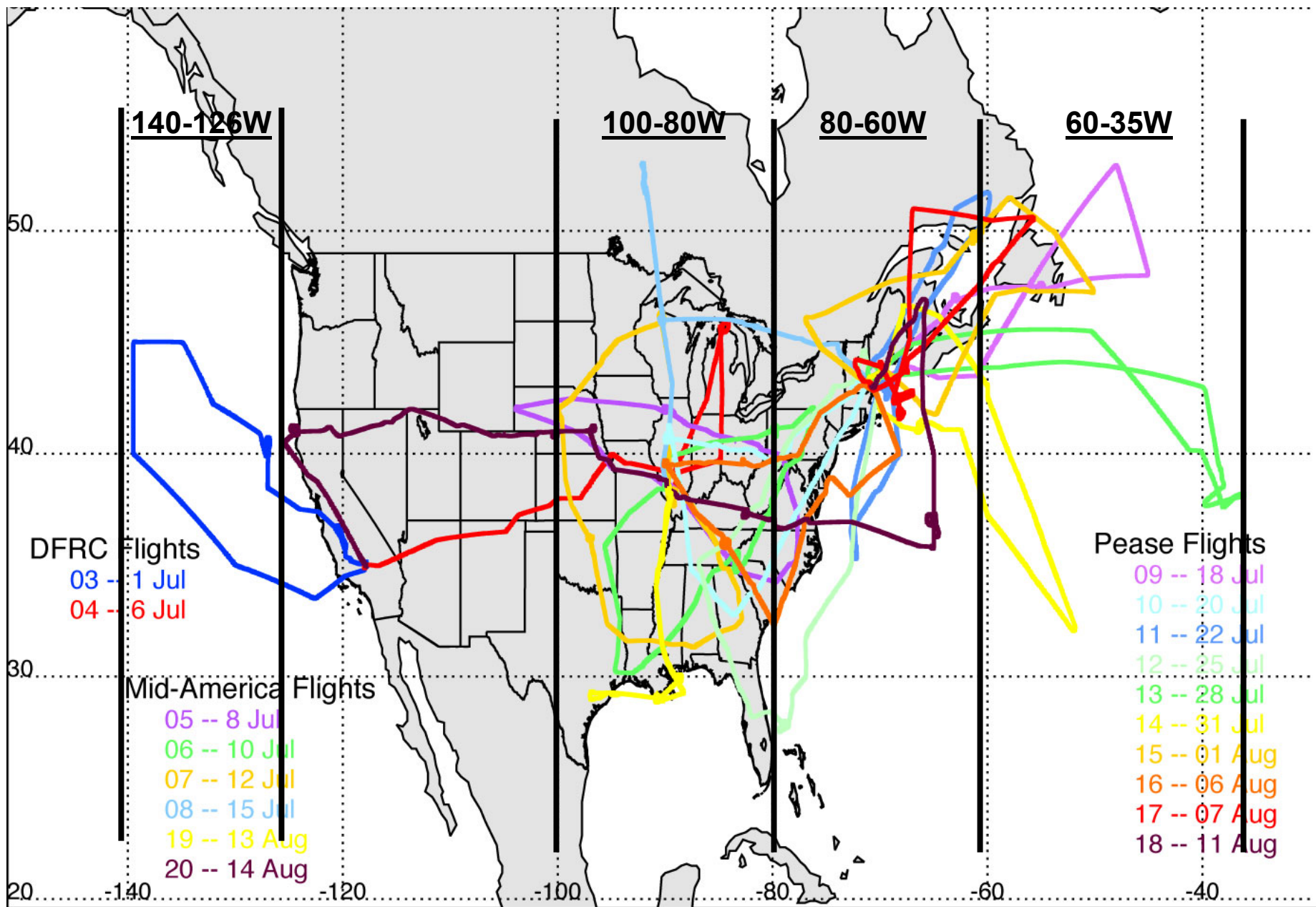
DC-8 Flight Track



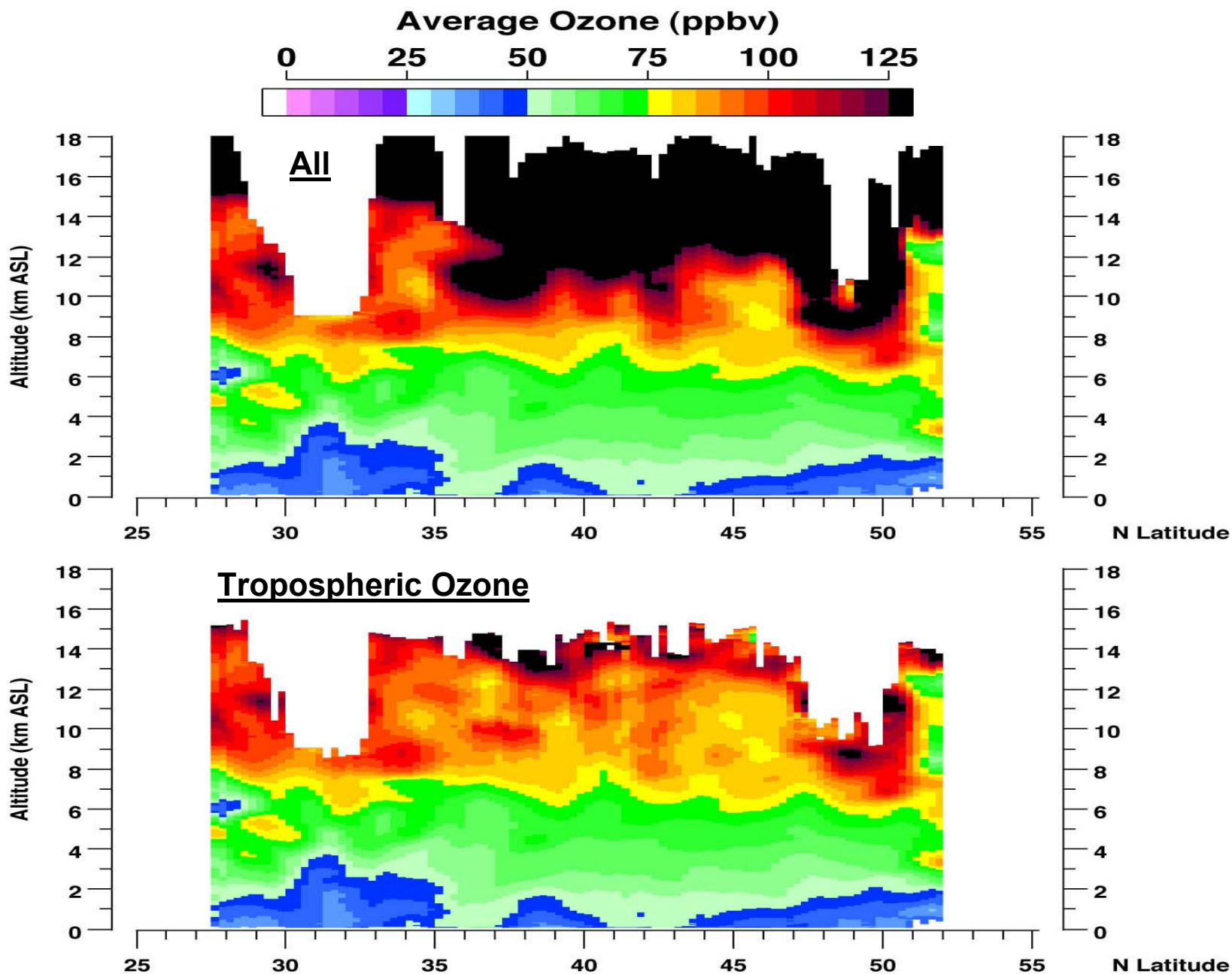
1 July 2004 (Flight #3) Asian & CA Outflow



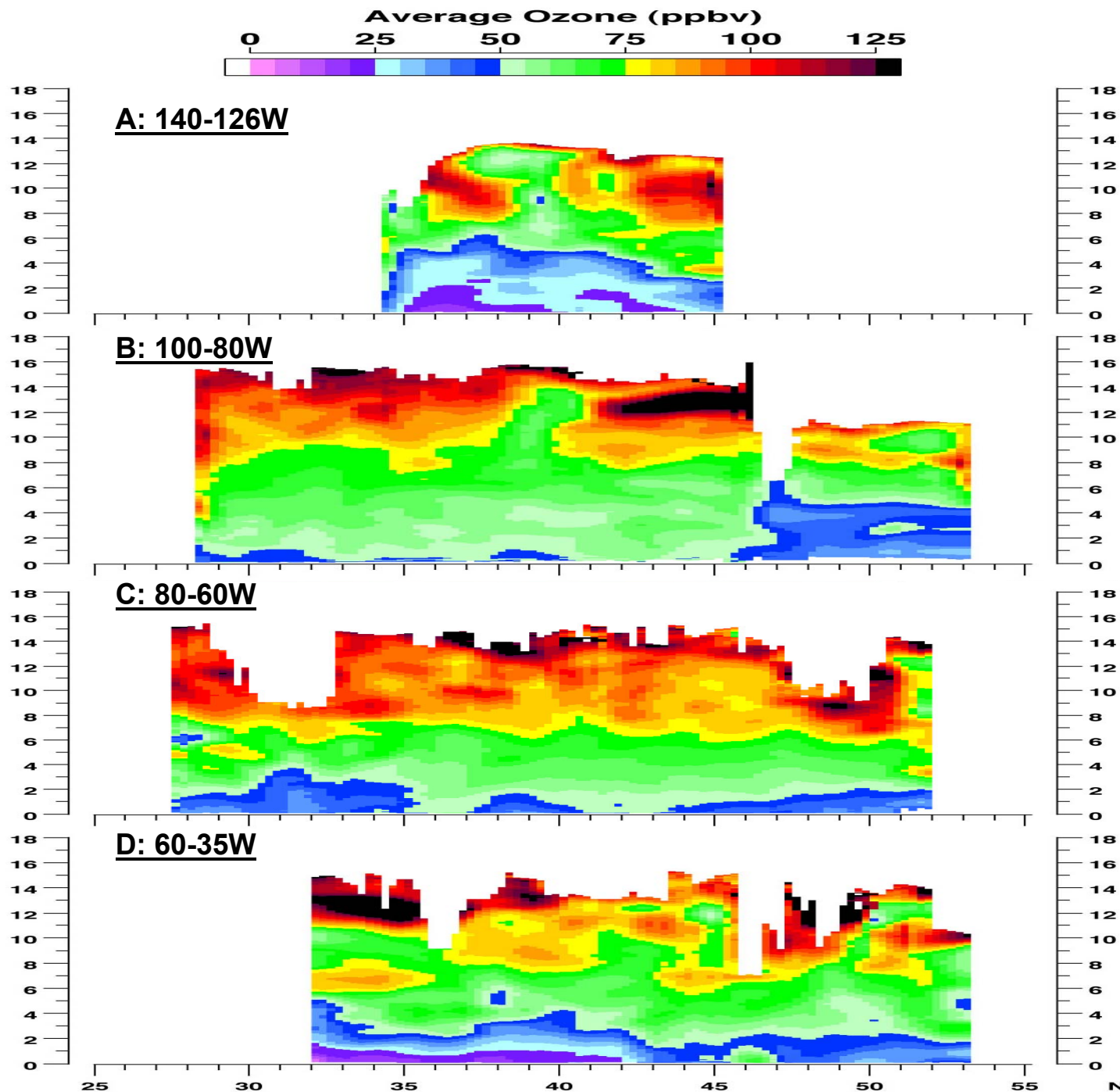
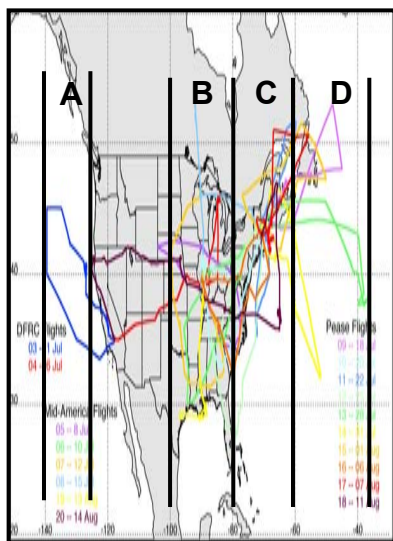
INTEX-NA: 1 July - 14 August 2004 (18 Flights)



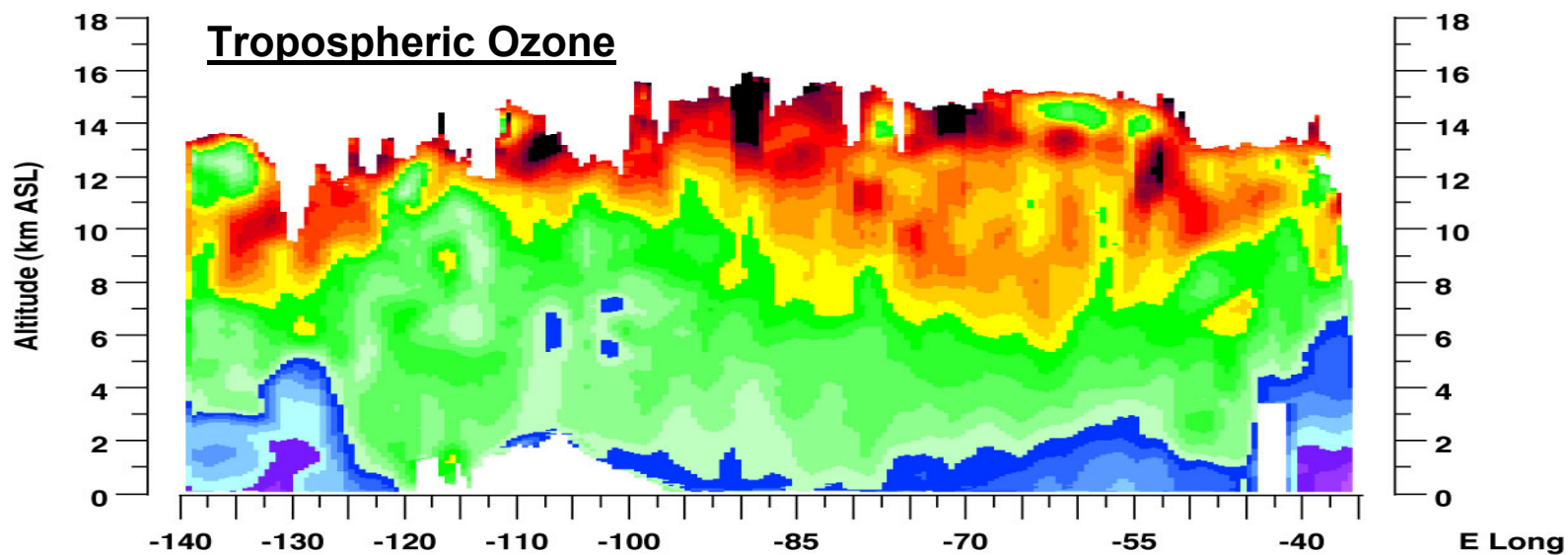
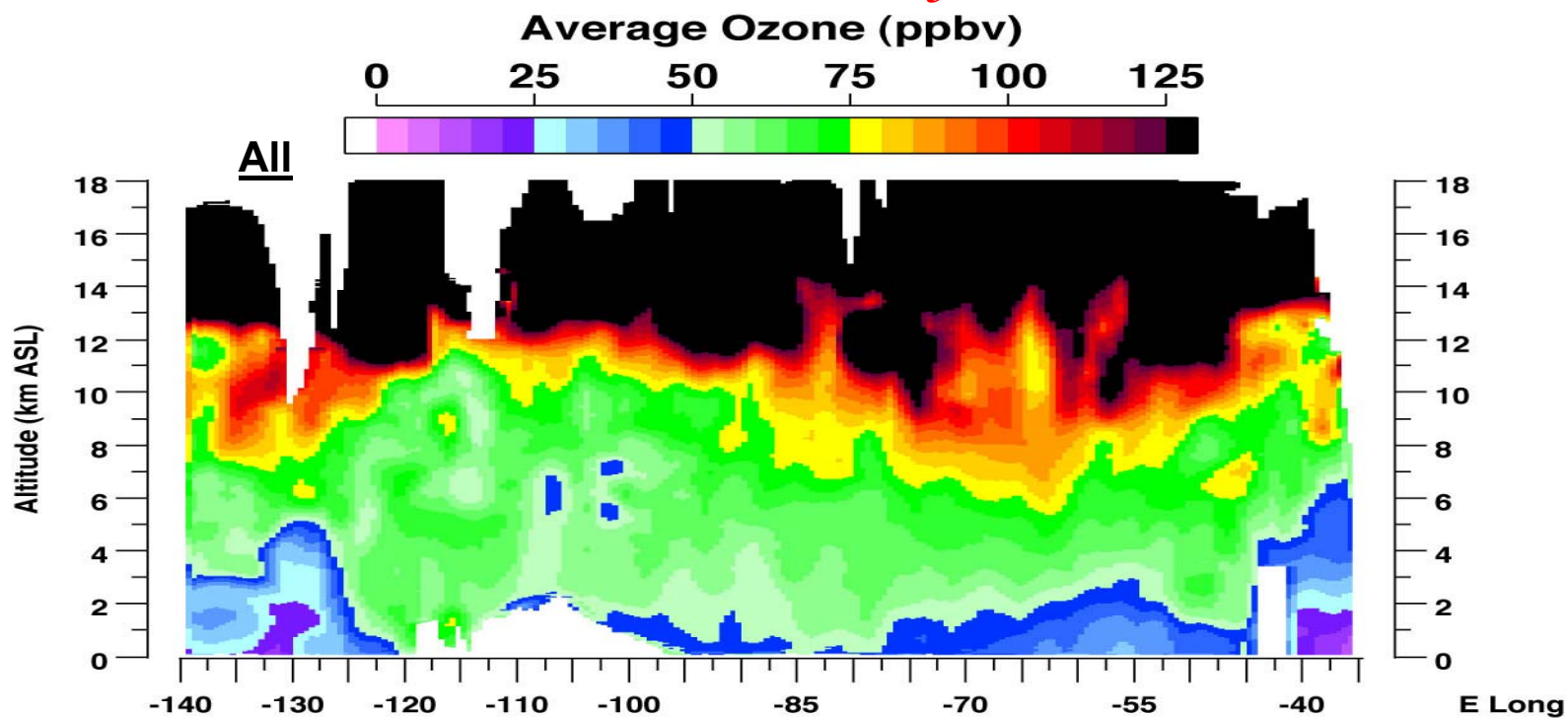
INTEX-NA: Average Latitudinal O₃ Distributions (80-60W)



INTEX-NA: Average Latitudinal Tropospheric Ozone Distributions



INTEX-NA: Average Longitudinal O₃ Distributions (25-55N)



Preliminary Results

- Obtained **large-scale distributions of O₃ and aerosol characteristics** from near surface to mid-trop./lower strat. on all but one INTEx-NA flights.
- Observed **long-range transport of Asian pollution** with enhanced aerosols and O₃ in mid-upper trop. in the eastern Pacific to possibly eastern U.S.
- Observed variable tropopause levels and presence of **stratospheric air mixed with polluted air masses** from up wind convection.
- Observed **enhanced aerosols and O₃** in lower troposphere associated with pollution **over the U.S. and advection over Atlantic**.
- Observed **aerosol characteristics & long-range transport of Alaskan fire plumes** to mid, eastern, and northeastern U.S. in layers which mixed into PBL in some cases **and Saharan dust** over southern U.S.
- Determined the **average latitudinal & longitudinal O₃ distributions** for examining the continental scale variations observed during INTEx.

All INTEx data images available at <http://asd-www.larc.nasa.gov/lidar/>

Future Activities

- Determine the **average aerosol lat. & long. distributions** to correlate with the average O₃ lat. & long. distributions.
- Complete **air mass categorization** based on O₃ , aerosol characteristics, and potential vorticity levels, vis-à-vis, TRACE-P.
- Determine **fraction of time each air mass type was observed** and the **relative contribution** of each air mass type to **trop. O₃ budget**.
- Determine **chemical characteristics of each air mass type** based on in situ measurements of the remotely categorized air masses.
- Determine the **eastward flux of O₃** observed over eastern North America and western Atlantic (80-60W).
- Compare **O₃ and aerosol results** with **model predictions**.
- Compare large-scale average **O₃ and aerosol distributions, air mass types, and fluxes** with **previous field experiments**.
- Collaborate with Science Team in **chemistry/transport process studies and satellite & model validation activities**.

See posters by Fenn et al. and Butler et al. for additional O₃ and aerosol results!